The Beagle, Records of the Museums and Art Galleries of the Northern Territory, 1998 **14**: 159-176

DESCRIPTION OF *ARICHLIDON* NEW GENUS AND TWO NEW SPECIES FROM AUSTRALIA; *BHAWANIA REYSSI* REDESCRIBED AND ASSIGNED TO *ARICHLIDON* (CHRYSOPETALIDAE: POLYCHAETA).

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ABSTRACT

Arichlidon hanneloreae gen. nov., sp. nov. is described from coastal and offshore coral reefs in tropical eastern and western Australian waters, Papua New Guinea, Indonesia and the Marshall Islands. *Arichlidon acropetalon* sp. nov. is described from deeper waters off north Queensland, eastern Australia. *Bhawania reyssi* Katzmann, Laubier and Ramos, 1974, is redescribed and assigned to the new genus *Arichlidon*. Additional material of *B. reyssi* is recorded from Cape Verde Islands, Eastern Atlantic; Mediterranean localities, including specimens from abyssal depths of the eastern Mediterranean, and the Red Sea. The new genus is characterised by a distinct convex, broad, short body form and the shapes of the highly ornamented lateral, main and median paleae groups. Epitokous spinigerous neurosetae, not recorded before in the Chrysopetalidae, are described for *Arichlidon hanneloreae* sp. nov..

KEYWORDS: Polychaeta, Chrysopetalidae, *Arichlidon*, new genus, new species, Australia, Indo-West Pacific, Mediterranean

INTRODUCTION

Species belonging to this chrysopetalid group have been recognised as problematical for some time. Laubier (1966) first recorded specimens from the waters off Beirut as 'Chrysopetalidae gen. sp.?'. Ramos (1973) later described specimens from the French and Spanish Catalan coasts as '*Heteropale* ?sp.' in her dissertation. Katzman, Laubier and Ramos (1974) then collaborated to describe a new species from the Adriatic, *reyssi*, provisionally placed in the genus *Bhawania*. Perkins (1985) recognised material from Florida waters as belonging to a new genus and species and in his key to the Chrysopetalidae referred specimens to "*Bhawania reyessi*" [*sic*]. Watson Russell recognised eastern and western Atlantic and Mediterranean specimens as belonging to the same new genus, in a paper given at the First International Polychaete Conference, Sydney, Australia, (1983) and made reference to this material in a number of publications as 'new genus 1' (Watson Russell 1986, 1987, 1991).

Material examined is in the following institutions: Australian Museum, Sydney (AM); Hebrew University Zoological Museum (HUJ); Los Angeles County Museum (LACM); Museum d'Histoire Naturelle, Paris (MNHN); National Museum of Natural History, Washington (USNM); Museum of Victoria (NMV); Naturhistorisches Museum, Wien (NMW); Queensland Museum (QM); Museum and Art Gallery of the Northern Territory (NTM); Senckenberg Museum, Frankfurt (SMF).

Setal terminology follows that of Watson Russell (1986, 1991). Setal counts, unless otherwise indicated, are taken from mid body segments. In the generic description, the setal count given is the most common range taken overall from a large number of individuals (very occasional higher counts are indicated in brackets). In the species descriptions the setal counts from the holotype are given first; those for additional material are enclosed in brackets.

SYSTEMATICS

Family Chrysopetalidae Ehlers, 1864
Genus *Arichlidon* gen. nov.

Type species. *Arichlidon hanneloreae* sp. nov., by original designation.

Diagnosis. Relatively short, broad body form; prostomium with two pairs violet-black eyes often fused, forming rectangular block visible beneath paleae of anterior segments. Lateral paleae fascicle intergrading smoothly with main paleae fascicle; distinctive group of asymmetrical, ornate median paleae interlocking at mid-dorsal line forming smooth convex ridge. Falcigerous inferior neurosetal blades, short, broad, non-dentate, curved with blunt tip.

Description. Body rectangular, broad, slightly tapered at both ends. Juveniles ovoid in shape. Maximum segment number 55. Body white to pale brown. Silver to gold coloured paleae fans, often flecked with brown scale, imbricate over dorsum, covering worm completely. Paleae in transverse row in notopodium with leading edges visible proximally; median paleae interlocking at mid-line, forming distinct convex median ridge. Broad notosetal fans extending entire width of dorsum; neuropodia tucked behind notopodia, only visible ventrally.

Anterior three segments in conjunction with prostomium largely retractable. Prostomium small, oval, compressed between anterior segments. Two pairs of large, violet-black eyes on dorsal surface of prostomium; eyes often fused to form solid pigmented rectangle. Single, large, subulate median antenna inserting anterior to anterior pair of eyes; two slightly longer lateral antennae inserting on antero-ventral margin of prostomium. Two long cylindrical palps inserting on ventral edge of prostomium. Triangular mouth fold ventral and posterior to palps; eversible proboscis with two transparent, distally serrate stylets. Semi-circular glandular nuchal fold present posterior to, and capable of covering, prostomium.

Segment 1 reduced, fused in part to prostomium; supporting a dorsal and ventral tentacular cirrus on each side; ventral pair originating adjacent to palps. First setigerous segment (segment 2) biramous, fused in part to segment 1; notopodium with small number of short paleae and dorsal cirrus; small neuropodium directed anteriorly with fascicle of spinigerous neurosetae; ventral cirrus absent. Short paleae of notopodia, segments 2-4, often including rounded primary (larval) paleae types. Segments 3 and 4 directed antero-laterally; all subsequent setigers directed laterally. All setigers except first with three types of paleae, dorsal and ventral cirri, spinigerous and falcigerous neurosetae. Interramal region ciliate; a number of ciliate tufts posterior to paleae fan insertion.

Notopodium with three to seven subacicular lateral paleae with 6-17 ribs. Lowermost lateral palea symmetrical, small, pointed, with finely serrate upper margin and finely serrate distal third of lower margin, with one finely raised rib, granules absent; uppermost lateral paleae, larger, slightly asymmetrical, with serrated margins and raised ribs. Tiny, serrate, simple seta usually present, posterior to overlying, dorsal acicula. Large group of broad, symmetrical main paleae with 13-22 ribs and one to eight raised and highly ornate ribs. Medial-most main palea (subunit 1) may be similar size and shape as other main paleae or taller, or broader and asymmetrical, with up to six raised ribs; present mid to posterior body. Narrow fascicle of four to six median paleae originating at angle to main fan. Each median palea grading in size and degree of acute asymmetry within fan. Lateral-most palea largest with outer margin straight, inner margin acutely bent and 11-18 ribs; this palea may be shorter, same size or taller than paleae of main fan. Mid-median group with 10-14 ribs; medial-most palea smallest, near symmetrical, pointed with 7-10 ribs and no raised ribs or granules. All other median paleae with one to four, usually three raised ornamented ribs. Subunit 2 palea slender, symmetrical with 8-11 ribs, two finely raised ribs, equally serrate margins present within median fascicle in posterior half or posterior-most segments of body. Large granules dense, scattered or absent on superior surface of majority of paleae types; paleae margins strongly serrate; close-set horizontal

striae between longitudinal ribs continuing to distal end of paleae; paleae terminating distally in distinctly elevated, shallow or sunken apex. Long, slender, subulate, slightly pseudoarticulated dorsal cirrostyle, often concealed behind paleae fan. Dorsal cirrophore and cirrostyle up to twice as long in posterior setigers, extending past pygidium.

Short, pointed neuropodia not extending past notopodia and supporting a subacicular fascicle of heterogomph neurosetae. Very slender, fine simple seta overlying ventral acicula, often visible extending past neuroacicula tip. Superior group of 1-3(5) spinigers with long slim shafts and fine attenuated blades with fine basal teeth. One extra or replacement subunit 1 short spiniger present within posterior segments. Mid-superior group of 2-6(8) falcigers with long blades in upper position, medium-length blades with robust basal teeth below. Mid-inferior group of 6-15(20) falcigers with medium to short-length blades with basal teeth. Inferior group of 6-10(15) falcigers with short broad blades with few to no teeth, terminating in blunt curved tip. Dentition on blades extending full length of blade stopping just before curved tip; last denticle forms opposing tooth to tip. Epitokous spinigers numbering 1-14 may be present in superior position of ventral ramus; spinigers composed of long to very long, slender shafts with almost homogomph joints and long, attenuated blades. Ventral cirri slender, weakly pseudoarticulated and a little shorter than dorsal cirri. Pygidium composed of rounded to quadrate dorsal structure with two short or long anal cirri, and a long ventral glandular cone.

Remarks. *Arichlidon* differs from all other chrysopetalid genera in possessing a relatively short, broad body form, a lateral paleae fascicle that intergrades with the main paleae fascicle and a distinctive group of asymmetrical ornate median paleae that interlock at the mid-dorsal line forming an arched smooth convex ridge (Fig. 1A-B). The shape of the falcigerous inferior neurosetal blades, short, broad, non dentate and curved with a blunt tip, are diagnostic of the genus (Fig. 3G-I). Another distinguishing character is the arrangement of the violet-black eyes.

The formula of cirri on the anterior segments of *Arichlidon* is the same as that found in the majority of chrysopetalid genera - *Strepternos, Paleanotus, Hyalopale, Treptopale, Paleaequor*, and *Bhawania*. The semi-circular nuchal fold of *Arichlidon* is similar to that seen in *Paleanotus, Treptopale, Paleaequor* and *Strepternos*.

Arichlidon species have previously been confused with those of *Bhawania* and *Paleanotus*. *Arichlidon* and *Bhawania* are distinctly different genera with the latter having a long rectangular body form of 100 plus segments covered in golden brown paleae and possessing different numbers and types of notosetae and neurosetae.

Paleanotus, Hyalopale and *Treptopale* form a closely related group within the Chrysopetalidae; the former two genera possess distinctly asymmetrical main paleae types distinguishing them from *Arichlidon*. *Treptopale* has ornate, symmetrical main notosetal types very similar to those of *Arichlidon* but both genera possess differently shaped appendages of the anterior segments, different pygidial forms and numbers and types of notosetae, especially the median group. The main paleae of *Arichildon* insert with leading edge facing the medial dorsal line, whereas in *Treptopale* the leading edge faces out towards the lateral line.

The ornate, symmetrical main paleae found in *Arichlidon* are also seen only in the larvae and juveniles of the deep sea chrysopetalid genus *Strepternos* (Watson Russell 1991). The small neuropodial simple seta, seen in *Arichlidon* adults (Fig. 3A), is found in juveniles and then lost in adults in the majority of other chrysopetalid genera. Some *Dysponetus* species, most likely neotenous forms, retain larger neuropodial simple setae. The tiny notopodial simple seta seen in *Arichlidon* adults (Fig. 1A) is also found in juveniles of other genera (Watson Russell 1986).

The shape of the two slender stylets is similar to those found across all chrysopetalid genera (Fig. 2C). The shape of the mouth fold and the robust, distally serrate stylets are most similar to those belonging to *Chrysopetalum* species. Two

specimens of *A. hanneloreae* were found to have the proboscis everted; in one specimen the stylet tips were just visible, in the other they were extended out half their length.

Arichlidon species are recorded from many crevicular habitat types, some of which are associated with sessile invertebrate animals eg tube dwelling polychaetes, tube dwelling amphipods and inside bivalve molluscs. It is possible that *Arichlidon* species are both scavengers and active predators on these invertebrates.

Arichlidon species can be found in large numbers in preferred habitats. *Arichlidon* species have been recorded across a broad range of habitat types, from tropical to temperate waters, world wide between 40° N and 39° S. They are found in seagrass, algal, sponge, hydroid and shell habitats, crevices in coral and rocky reefs, rotting wood in mangrove channels, and from every grade of sand, clay and mud substrate in warm shallow waters to the edge of the continental shelf and beyond to abyssal depths. Depths in which they are found range from the intertidal to 3947 m.

Etymology. The name *Arichlidon* is a combination of the Greek *ari*, meaning "highly", and *chlidon*, meaning "ornamentation', and refers to the raised ribs sculptured with large cusps down the length of the superior surface of paleae. Gender neuter.

Key to *Arichlidon* species

1a. Mid-body segments with lateral-most median palea the tallest palea in fan (Fig. 4C) 2

1b. Mid-body segments with lateral-most median palea not the tallest palea in fan (Figs 1C, 4A-B) ..... *A. hanneloreae* n. sp. (Australia, Indo-West Pacific)

2a. Main paleae with distinct broad 'shoulders'; small elevated apices and granules (Fig. 6G-H)... *A. reyssi* (Eastern Atlantic, Mediterranean, Red Sea).

2b. Main paleae with distinct rounded 'shoulders', large elevated apices, granules absent (Figs 5A-B, 6E-F) ..... *A. acropetalon* n. sp. (North Queensland, Australia).

***Arichlidon hanneloreae* sp. nov.**
(Figs 1A-D, 2A-D, 3A-J, 4A-B, 6A-D, I-J)

Bhawania cryptocephala non Gravier - Hartman, 1954: 628.

Type material. HOLOTYPE - Australia, Queensland, Townsville, Halifax Bay, Stn.79-2A-14, sediments near coral reef, 2 m, coll. J. Carey, February 1979, 1, NTM W1563, length 3.7 mm, width 0.92 mm, 33 segments entire; PARATYPES - 3, same data as holotype. Length 2.4 mm, width 0.8 mm, 28 segments entire; length 2.1 mm, width 0.75 mm, 20 segments entire, 2, NTM W1564; 23 segments, near entire; 1, BMNH ZB1985.81.

Additional material. (Selection). VICTORIA, Western Bass Strait, Stn. 71, 39° 22'2" S, 143° 10'1" E, medium fine sand, 101 m, 10 October 1980, coll. G.C. Poore, HMAS *Kimbla*, 1, NMV F82,902. TASMAN SEA, Lord Howe Island, Balls Pyramid, 31° 46' S, 159° 16' E, dredged, 91-183 m, coll J. MacIntyre, CSIRO Fisheries, 22 November 1960, 1, AM W23231; Middleton Reef, 29° 27' 4" S, 159° 03' 7" E, Site 8, outer slope near *Runic* wreck, dead coral and algae in surge channels, 15 m, coll. P.A Hutchings, 5 December 1987, 2, AM W23370; Elizabeth Reef, 29° 57' 2' S, 159° 01' 2" E, outer slope west of *Yoshin Maru Iwaki* wreck, 12 m, coll. P. Hutchings, 10 December 1987, 1, AM W23358. QUEENSLAND, Gladstone, Site 4, mud, 12 m, dredge, coll. W.S., 6 November 1975, 1, QMH 615; Heron Island, reef pool, 12 July 1983, coll. W. Westheide, 6 November 1975, 1, NTM W13189; Low Isles, coral rubble washings, 6-8 m, coll. C. Watson Russell, 22 December 1987, 2, NTM W13186; Lizard Island, Chinamans Head, 14° 36' S, 145° 38'E, Stn. 76 Liz B06.12.3, reef rock, coll. P. Hutchings and P. Weate, 8 January 1977, 2, AM W23237; same locality, substrate and collectors as previous, Stn. 76 Liz B06.12.2, 8 December 1977, 1, AM W23236; near Bird Islet, 14° 36'S, 145° 38' E, Stn. 76 Liz A12.24.3, reef rock, same collectors as previous, 22 January 1978, 5, AM W23234; grid on reef floor on windward outer slope between Bird Islet and South Island, Stn. 76 Liz A00.09.2, 12m, coll. P. Hutchings, 1, NTM W13191; Outer

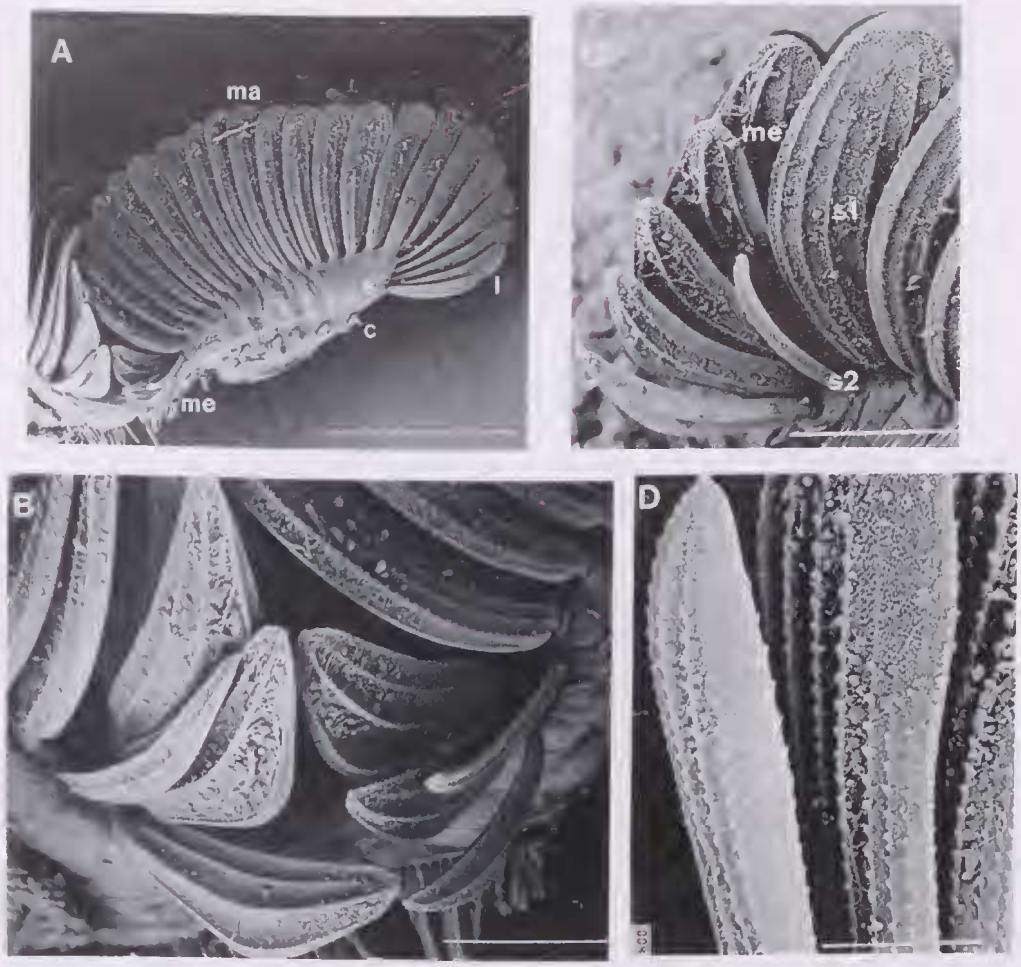

Fig. 1. Scanning electron micrographs. **A-B**, *Arichlidon hanneloreae*, LACM n. 10164. **A**, mid body notopodium; **B**, close up of median paleae group. **C-D**, *A. hanneloreae* AM W23231. **C**, mid body, notopodium in part, median paleae group; **D**, detail of raised ribs and granules of main paleae. Abbreviations: **l**, lateral sub-acicular paleae group; **ma**, main paleae supra-acicular group; **me**, median paleae group; **s1**, subunit 1 palea (medial most main); **s2**, subunit 2 palea; **s**, tiny dorsal simple seta, **c**, cilia tuft. Scale: A= 250µm: B-D = 50µm.

Yonge Reef, 14° 36'S, 145° 28' E, Stn. 77 Liz 53-1, *Halimeda* covering coralline pink algae, 20 m, coll. P. Hutchings and P. Weate, 21 January 1977, 5, AM W23209; north-west of Lizard Island, Cooks Passage, Cod Hole, 14° 31' S, 145°34' E, reef rock, 10 m, 4 September 1995, coll. A. Murray, 1, AM W23207. NORTHERN TERRITORY, Gulf of Carpentaria, 15° 21' 47"S, 136° 31'13", Bing Bong, Stn. T7A, 14-17m, September 1992, coll. J. R. Hanley *et al*, 1, NTM W13143; Gove, Melville Bay, Stn. A15W, 4 m, sand and little mud, 19 March 1992, coll. J. R. Hanley *et al*., 2, NTM W13026; Weed Reef, Darwin Harbour, 12 m, silt, coarse sand and shell, coll. P. Horner, 2, NTM W2052; Central Darwin Harbour, Stn. D61A, 3 m. gravel, coarse sand, 7 July 1993, coll. J. R. Hanley *et al*., 1, NTM W13119. WESTERN AUSTRALIA, off Broome, 16° 33' S, 121° 29' E, Stn. 85-2, 40 m, beach coralline rock with sponge growth, coll. B.C. Russell, pair trawl, 17 April 1985, 2, NTM W2933; Ashmore Reef, NW end, outer reef slope, coralline algae and coral rubble washings, 15 m, 23 February 1984, coll B.C.

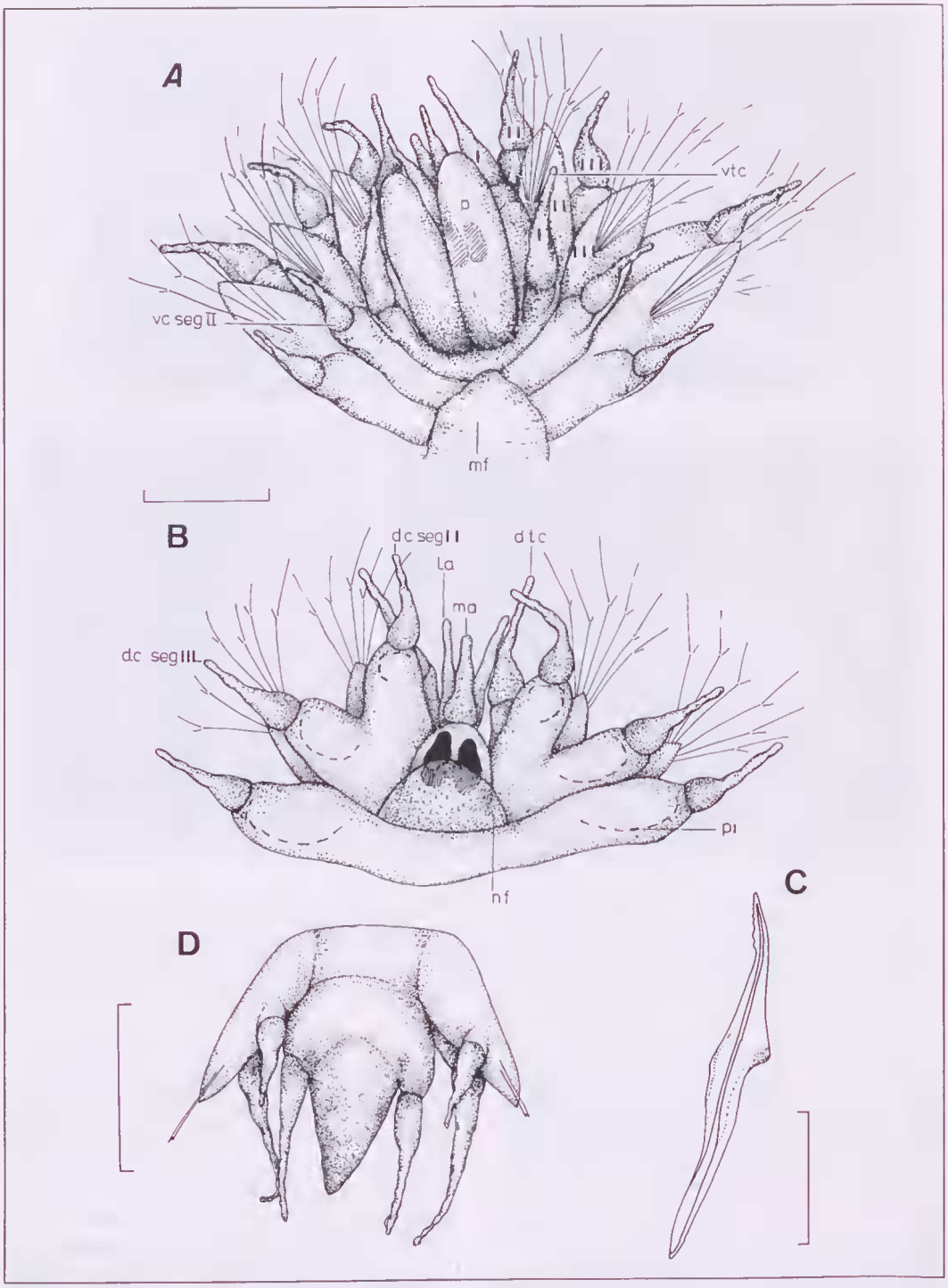

Fig. 2. A-B, *Arichlidon hanneloreae*, NTM W.1564. **A**, anterior end, ventral view. Abbreviations: **mf**, mouth fold; **p**, palp; **vtc**, ventral tentacular cirrus; **vc seg. II**, vental cirrus segment two; **I**, segment one; **II**, segment two; **III**, segment three; **B**, anterior end, dorsal view. Abbreviations: **ma**, median antenna; **la**, lateral antenna; **dtc**, dorsal tentaeular cirrus; **dc seg. II**, dorsal cirrus segment two; **dc seg. III**, dorsal cirrus segment three; **pi**, paleae insertion; **nf**, nuchal fold. **C**, *A. hanneloreae*, USNM 45381, stylet. **D**, *A. hanneloreae*, NTM W1564, pygidium, ventral view. Scale: A, B = 0.1 mm; C = 0.04 mm; D = 0.2 mm.

Russell, 1, NTM W9304; Imperieuse Reef, Rowley Shoals, dead coral and soft coral washings, 70 m, coll. B.C Russell, 1, NTM W9305; SW of Rowley Shoals, 19° 29. 6' S (to 19° 29.5'), 118° 52.2' E (to 118° 52.7), Stn. 127, supernatant off echinoderms, 38 m, bottom trawl, 30 August 1983, 1, NTM W3704; NW Shelf, 19° 35' S, 115° 27' E, Stn. WP93/9B, locally cemented horizon with superficial sediments, 77 m, coll. Woodside Petroleum, 23 October 1993, 1, NTM W13092. PAPUA NEW GUINEA, Madang, Malamal, coral rubble and mud beds, 2-7 m, 25 October 1991, coll. J.R. Hanley, 2, NTM W7577; Madang, Sandy Bay behind Wongat Island, coral rubble in sand, 3-6 m, 19 October 1991, coll. J.R. Hanley, 7, NTM W7574. SOLOMON ISLANDS, Matiu Is., coral reef platform, LWM, coll P.E. Gibbs, 7 August 1965, fragments, BMNH 1970-208. INDONESIA, Flores, Maumere, reef outside Sao Wisata, coral rubble and detritus, 5 m, 3 August 1987, coll. C. Watson Russell, 18, NTM W13185; same locality, coral rubble and encrusting fauna, 2.5 m, 2 August 1987, coll. C. Watson Russell, 7, NTM W13184; SW Sumatra, Sanding Island, Pulo Stupai, 3°26'S, 100° 40'E, December 1963, coll. A.J. Kohn on Te Vega Expedition, 1, USNM 45381. MICRONESIA, Marshall Islands, Eniwetok Atoll, Loc. 1519, coral reef, 1 m, coll. H.S. Ladd, 1, LACM (AHF) n. 10164.

Description. Description based on holotype with numerical information based on additional material in brackets. Holotype entire 33 segments. Anterior segments relaxed. Subulate median antenna visible on anterior edge of prostomium; two pairs of eyes visible above nuchal fold; two long cylindrical palps visible ventrally (Fig. 2A-B). Segment 2 (setiger 1) with five short paleae with 8-10 ribs. Segments 2-4 with two to three paleae types, usually including primary (larval) paleae types (Fig. 6I).

Subsequent body segments with notosetae comprising four to five (six to seven) lateral paleae; lower 2 with 6-11 (12) ribs, upper group with 10-14 ribs of which three to four (occasionally five) raised. Main paleae number 10-15 (19) with 14-16 (17, rarely 18, 19) ribs including four to seven raised ribs of which three to four extend full-length of palea. Most medial main palea (subunit 1), broad, asymmetrical with 16 (17, rarely 18) ribs and five to six raised ribs. This palea is first present about 15th segment, continues to most posterior segment; generally tallest palea in the fan, the same size or sometimes slightly smaller than largest median palea (Figs 1C; 4A-B). Median paleae number four to five, inner two with 8-10 (7-11) ribs, outer group with 11-13 (14-16, rarely 17) ribs; tallest median palea with 13 (14–16, rarely 17) ribs, most evident mid body. Subunit 2 symmetrical, slender, palea with seven to nine ribs of which two to three finely raised; coming in at mid body and continuing to end of body (Figs 4A; 1C). This palea not always present on all posterior segments and often difficult to see. Notopodia within posterior ten segments with smaller numbers of paleae, rounded lateral types, shorter, more slender median group (Fig. 6J).

Main and median paleae broad to very broad with small elevated to sunken apices, (juvenile specimens with remnant hoods), serrate margins, raised ribs with small serrated cusps, dense granulation on superior palea surface (Fig. 1D).

Neurosetae comprising superior group of one or two (three) spinigers with long slim shafts and attenuated blades (Fig. 3C); one extra or replacement short spiniger present within posterior setigers. Mid superior group comprising two to three long bladed falcigers in upper position (Fig. 3D) and four to eight medium length bladed falcigers below (Fig. 3E); all types with dentate blades. Mid inferior group of 6-10 (15) falcigers with shorter broader blades (Fig. 3G-H). Inferior group of 8-10 (15) falcigers with short broad blades (Fig. 3I); latter two groups of neurosetae with no dentition on blades. Pygidium composed of slender ventral cone and two anal cirri on dorsal pygidial structure (Fig. 2D).

Remarks. It is always important, where possible, to compare mid-body segments from similar sized specimens to determine species. Adult specimens of *Arichlidon hanneloreae* are distinguished from *A. reyssi* by possessing a tall medial-most main palea (= subunit 1 palea), nearly always the highest palea in the fan in mid-body

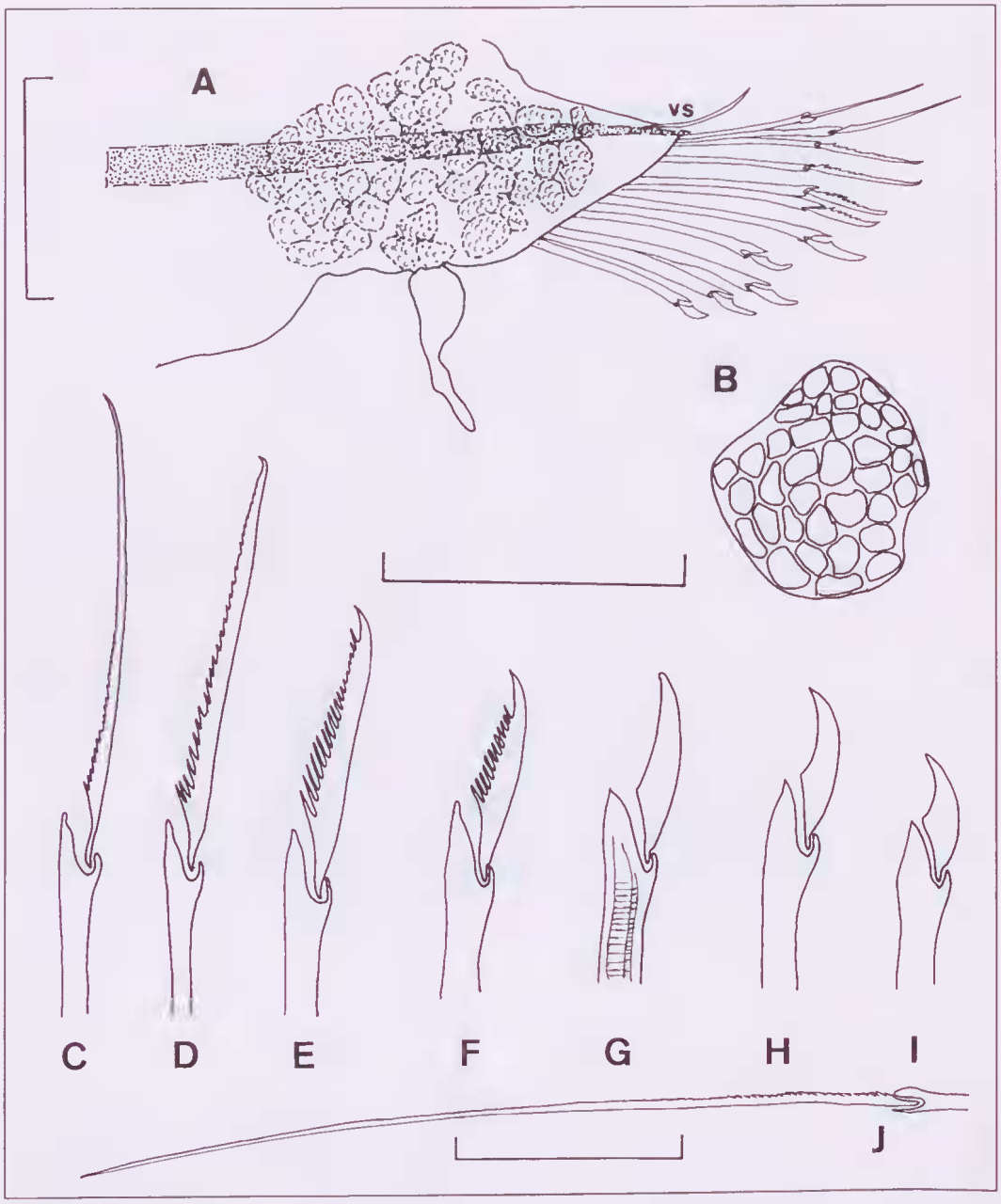

Fig. 3. *Arichlidon hanneloreae*, QM GH 615, female with eggs. **A**, neuropodium, segment 20, anterior view, v s, simple seta; **B**, detail of egg packet; **C**, superior spiniger; **D, E**, mid superior falcigers; **F**, mid inferior falcigers; **G-I**, inferior falcigers; **J**, epitokous spiniger. Note: epitokous spinigers not drawn in A. Scale: A = 0.1 mm, B-J = 0.04 mm.

segments (labelled S1 in Figs 1C, 4A). In *A. reyssi* the tallest palea in the fan in mid-body segments is the lateral-most median palea (palea labelled ME, Fig. 4C).

Three entire juvenile specimens of *Arichlidon hanneloreae* from Indonesia (9, 10 and 13 segments) all possessed four to five juvenile broad median paleae that are

distinctly shorter than the main paleae. In the 9 and 10 segmented material the large subunit 1 palea is present in the posterior most segments and in the 13 segment specimen from segments 8-13.

In posterior segments of a 13 segment specimen from Queensland the tallest median is shorter to the same size as the subunit 1 palea. It is clear that setal types are being replaced with growth and that the adult median paleae are present from around 13 segments and larger individuals. In two adult *A. hanneloreae* specimens the lateral-most median palea is the tallest in the fan in anterior segments and continues as the tallest or at the same height as the main paleae until segment 15 in 50 segments and segment 17 in 55 segments, when the the subunit 1 palea first is present.

In adult *Arichlidon hanneloreae* material in the mid-body, the subunit 1 palea predominates as the tallest palea in the fan especially when there are four median paleae in the fan (i.e. tallest median absent, Fig. 4A). When there are five median paleae (ie. tall median present), the subunit 1 palea may be taller (see Fig. 1C), the same size (Fig. 4B) or in some instances slightly smaller than the tall median. Between segments 15-45 of the dissected 50 segment *A. hanneloreae* specimen, 16 notopodia had the subunit 1 palea the same height, 10 had the subunit 1 palea taller and 4 the subunit 1 palea smaller than the lateral-most median.

In adults of *A. reyssi* the lateral-most median palea is the tallest palea in the fan in anterior segments and continues as such down the body. In a dissected 41 segment entire specimen of *A. reyssi* the adult lateral-most median palea comes in from segment 5 and predominates as the tallest palea in the fan until segment 35 (Fig. 4C). The subunit 1 palea is present from the 14th segment.

The small subunit 2 palea, which intergrades between the main and median paleae groups, is not counted as a median palea as it is often difficult to see or may be absent. The subunit 2 palea is present from midbody segments in both *A. hanneloreae* and *A. reyssi* species.

In this review all three *Arichlidon* species, possess similar anterior ends, pygidia and neurosetal types. Species differences are only discernible between paleal notosetal shapes and lengths and their position in the body. The morphological characters at the species level in *Arichlidon* are therefore very conservative. This has been observed by the author in a number of other chrysopetalid genera. However, the small differences seen are usually very consistent, as the great number and range of material examined and whole specimens dissected, illustrates.

Table 1 shows that the majority of *A. hanneloreae* specimens possess lower rib counts of the lateral and main paleae compared to A. reyssi. Exceptions are certain specimens from offshore Western Australia (NW Shelf and Rowley Shoals) that possess comparatively high rib numbers of lateral, main and median paleae. An eastern Australian coastal specimen (Gladstone, Queensland) has similar high median and main paleae rib counts.

It has also been observed in *Arichlidon hanneloreae* that individuals from coral reefs often have main paleae with broader 'shoulders' and more sunken apices (compare Figs 6A-B with 6C-D).

Epitokous setae. Two benthic specimens of *Arichlidon hanneloreae* possess accessory neurosetae that originate from a position just below the ventral acicula, i.e. superior to the normal set of neurosetal types. These fine setae are composed of slender shafts that are internally dissected with horizontal striae, poorly chitinized homogomph joints and long, slender spinigerous articles (Fig. 3J). Overall they are longer than the normal neurosetae and are present in most body segments eg. epitokous setae number from five per parapodium until the posterior seven segments of the posterior body specimen from Gove (NTM W.13026) and up to 14 per parapodium from segment 14 to 38 in the 43 segment entire specimen from Gladstone (QM GH 615).

Both these specimens are ovigerous females with mature egg 'packets' measuring 0.04-0.06 mm across and individual units inside 0.0045 mm (Figs 3A-B). *Arichlidon* is known to possess planktonic larvae which have been collected and described from coastal embayments (Cazaux 1968 as C. *debile*; Watson Russell 1987). Gametogenic adults with accessory neurosetae of an

Table 1. Comparison of setal types (mid-body) within and between *Arichlidon* species.

Locality	Reg. no.	No. segments entire	No. lateral paleae	No. ribs lateral paleae	No. median paleae	No. ribs median paleae	No. ribs main includ. subunit 1 palea	Species
Bass Strait	NMV F82,902	21	4-6	8-14	5	7-13	14-16	*A. hanneloreae*
Middleton Reef	AM W23370	48	5-7	7-15	5	8-14	14-16	"
Gladstone	QM GH 615	43	4-6	7-14	5	8-16	14-17	"
Townsville	NTM W1563	33	4-5	6-14	5	8-13	14-15	"
Lizard Is.	NTM W13191	52	4-6	6-13	5	7-14	14-16	"
Madang	NTM W7574	42	5-6	8-15	4-5	8-13	14-16	"
Darwin Harbour	NTM W. 2052	22	5-6	6-14	4-5	9-15	16-18	"
NW Shelf	NTM W13199	40	5-7	7-15(17)	5	9-16(17)	15-17(19)	"
Ashmore Reef	NTM W9304	53	5	7-14	5	9-16	14-16	"
Sumatra	USNM 45381	45	4-6	8-14	5	9-15	14-16	"
Marshall Is.	LACM n10164	Mid body segs	5-6	8-15	4-5	9-14	14-15	"
North of Hinchinbrook Is.	AM W23347	38	5-7	6-16	5	9-16	16-18	*A. acropetalon*
Cape Verde Is.	NTM W13190	37	4-5	8-15(17)	4-5	9-17	14-16(19)	*A. reyssi*
Spain	NTM W2590	41	4-6	8-15(16)	4-5	9-15(17)	14-16(17)	"
E. Mediterranean.	SMF 5002	51	4-6(7)	9-15	4-5	10-16	14-17(18)	"

undescribed American *Arichlidon* species have also been collected from the plankton.

Divergence from the normal type most commonly relates to sexual maturity and the acquisition of epitokous swimming setae, especially capillary setae, is seen in gametogenic adults from a number of other polychaete families (Schroeder and Hermans 1975). This is the first observation of epitokous setae found in benthic and planktonic individuals within the Chrysopetalidae.

Distribution and habitat. *Arichlidon hanneloreae* is found in the warm waters of Australia, South east Asia and Papua New Guinea between 31° S and the Equator (Fig. 7). It has also been recorded from the Marshall Islands in the western Pacific. In this study *Arichlidon hanneloreae* has been predominantly recorded from Australian offshore coral islands, reefs, atolls and volcanic submerged sea mounts as far west as Ashmore Reefs and Rowley Shoals, Western Australia to Middleton Reef and Lord Howe Island, Tasman Sea, eastern Australia.

In areas where there has been intensive collecting the species occurs in moderate numbers over a wide range of coral habitats, eg. Lizard Is, northern Great Barrier Reef, from protected reefs in lagoons to pristine reefs in clear, deep waters of the outer barrier. Hutchings and Murray's (1982) study of recruitment of polychaetes to dead coral substrates showed that chrysopetalid taxa, of which *Arichlidon hanneloreae* made up a sizeable part, constituted fourth of the seven most dominant taxa. Large numbers settled preferentially to older blocks at the windward side between January and April, suggesting summer recruitment by planktonic larvae at a site exposed to the SE trade winds.

Arichlidon hanneloreae has also been recorded from coastal locations of Queensland and the Northern Territory in bays and harbours from more turbid waters. Where benthic studies have been carried out, the species has been found in consistently moderate numbers from a range of habitats eg. from silt, fine and coarse sand, gravel and shell from Darwin Harbour and Melville Bay, Gove in dry and wet seasons.

It is known that the south-eastern coast of Australia receives periodic surface currents from Great Barrier Reef waters (Veron 1974) and therefore offers potential sites for settlement of planktonic larvae of tropical polychaete species. As *Arichlidon* species have been recorded as possessing such larvae, the presence of a single specimen of *Arichlidon hanneloreae* from a large benthic survey in the temperate waters of Bass Strait, Victoria is not surprising.

Etymology. This species is named in honour of Hannelore Paxton, who influenced my decision to work in polychaete taxonomy.

Arichlidon acropetalon sp. nov.
(Figs 5A-B; 6E-F)

Type material. HOLOTYPE - Australia, Queensland, North of Hinchinbrook Island, 18° 11' 01" S, 147° 25' 50" E, Stn. 22, 490-472 m, sled, coll. *RV Franklin*, 26 August 1988, 1 specimen, female with eggs, AM W23347.

Description. Holotype entire 38 segments; length 5.6 mm, width 1.00 mm. Prostomium with long palps, long subulate median and lateral antenna visible in ventral view. Mid body setigers with notosetae comprising five to seven lateral paleae; outer two with 6-11 (rarely 12) ribs, inner group with 13-15 (rarely 16) ribs of which four to five finely raised (Fig. 5A). Main paleae number 13-15 with 16-18 ribs including four to seven raised ribs of which three to four extend full length of palea. Most medial main palea (subunit 1) very slightly asymmetrical with 16-18 ribs and five raised ribs. Median paleae number five; inner two with 9-12 ribs, outer group with 13-16 ribs; tallest median palea with 15-16 ribs, second tallest median palea with 15-16 ribs (Fig. 5B). Subunit 2 symmetrical median palea with 9-10 ribs of which two to three finely raised. Lateral, main and median paleae with elevated distal ends, distinct pointed apices, rounded shoulders, fine serrate margins; granulation absent (Fig. 6E-F).

Neurosetal types as for *A. hanneloreae*; ventral cirri long, very slender. Pygidium slightly damaged; with ventral cone, anal cirri not visible.

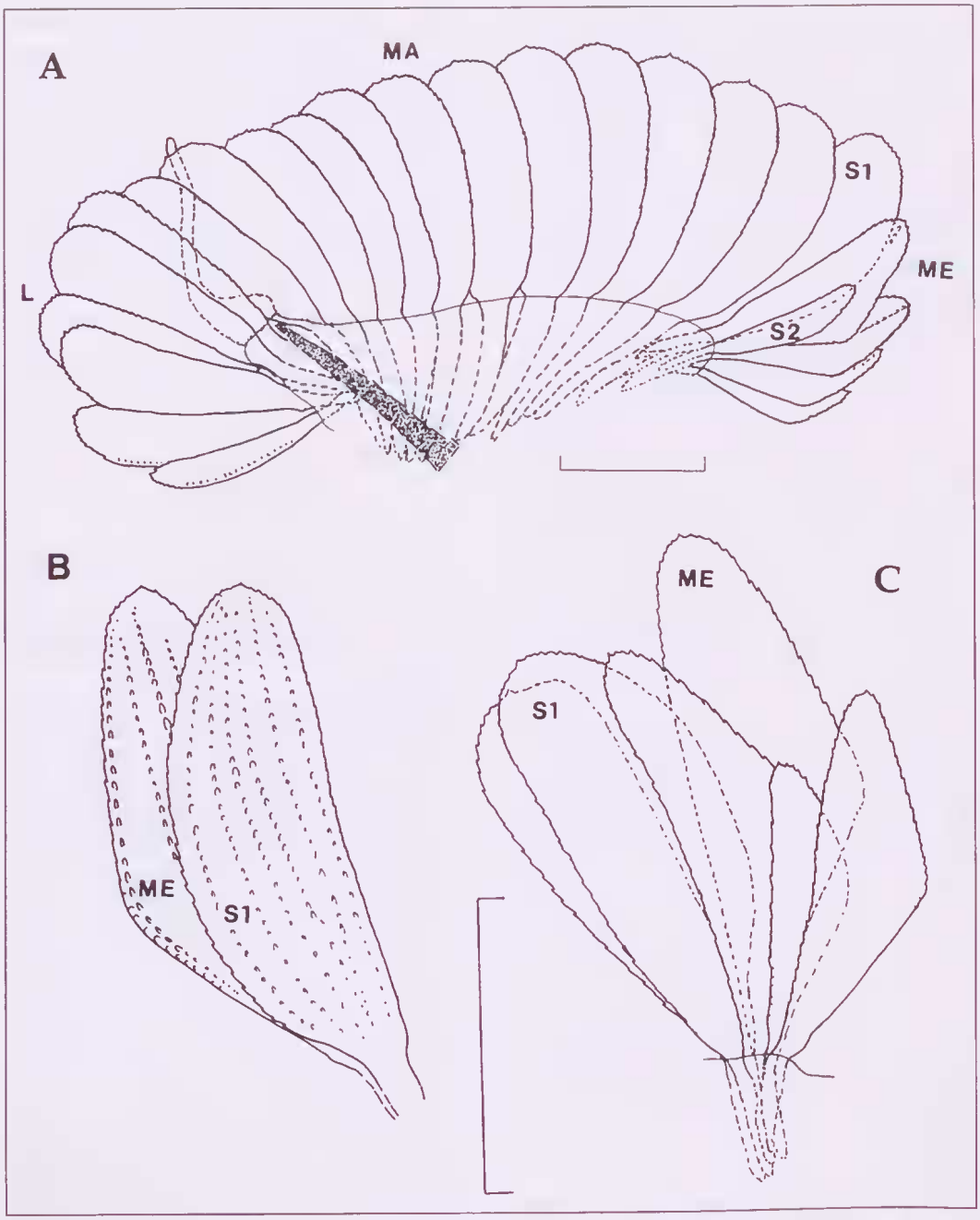

Fig. 4. **A**, *Arichlidon hanneloreae*, NTM W1564, notopodium, segment 15, anterior view; **B**, *A. hanneloreae*, NTM W13092, notopodium in part, segment 19, anterior view; **C**, *A. reyssi*, NTM W2590, notopodium in part, segment 19, anterior view. Abbreviations as for Figure 1. Scale = 0.1 mm.

Remarks. Considering the morphological conservatism of *Arichlidon* species over a large area and depth gradient it was perplexing to find a mature specimen from moderately deep waters off the Queensland coast that differed quite markedly from the *A. hanneloreae* type.

Paleae types of *A. acropetalon* possess distinctly rounded 'shoulders' and highly elevated apices lacking granules which

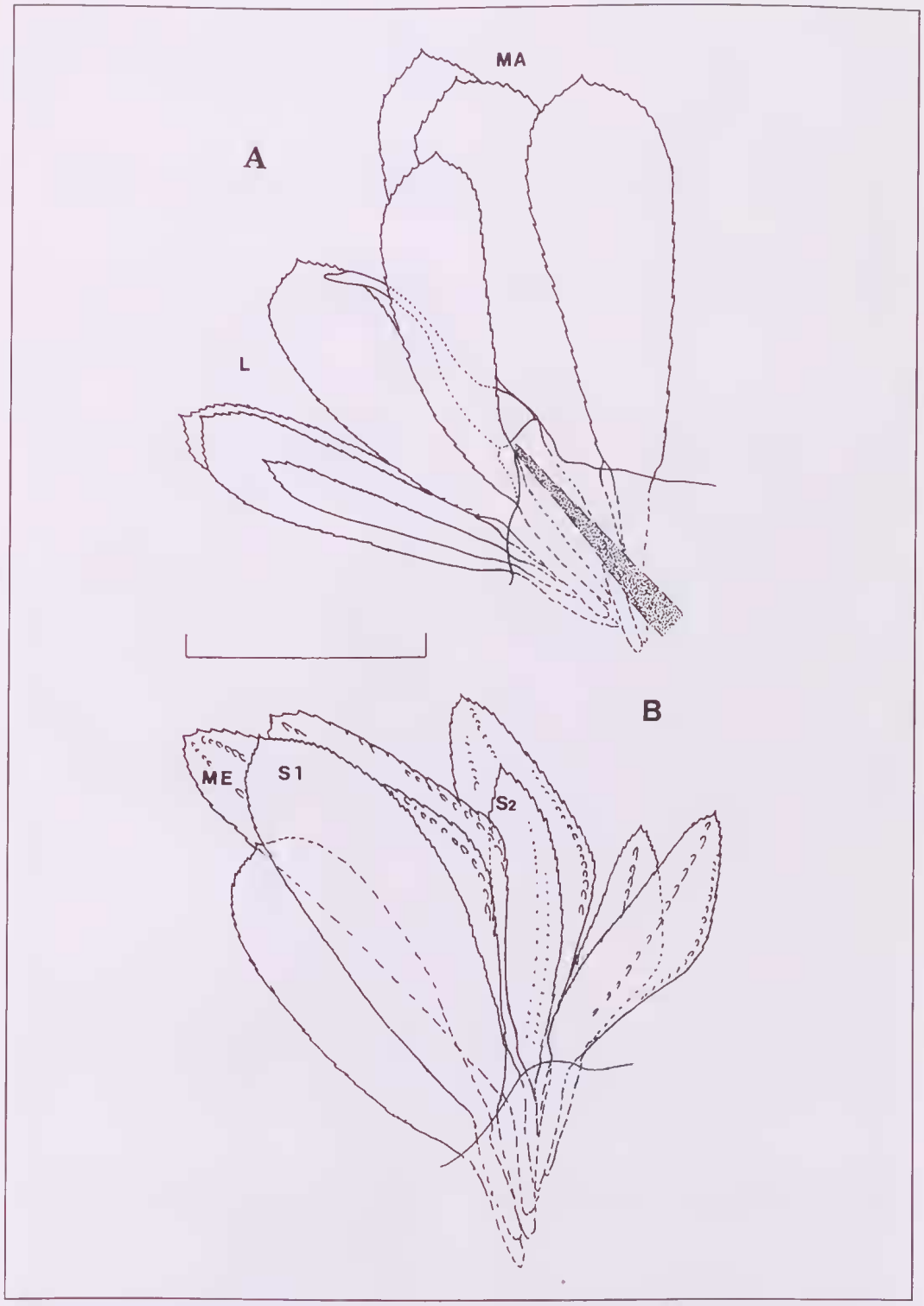

Fig. 5. *Arichlidon acropetalon*, AM W23347. **A, B**, notopodium in lateral and medial parts, segment 15, anterior view. Abbreviations as for Figure 1. Scale = 0.1 mm.

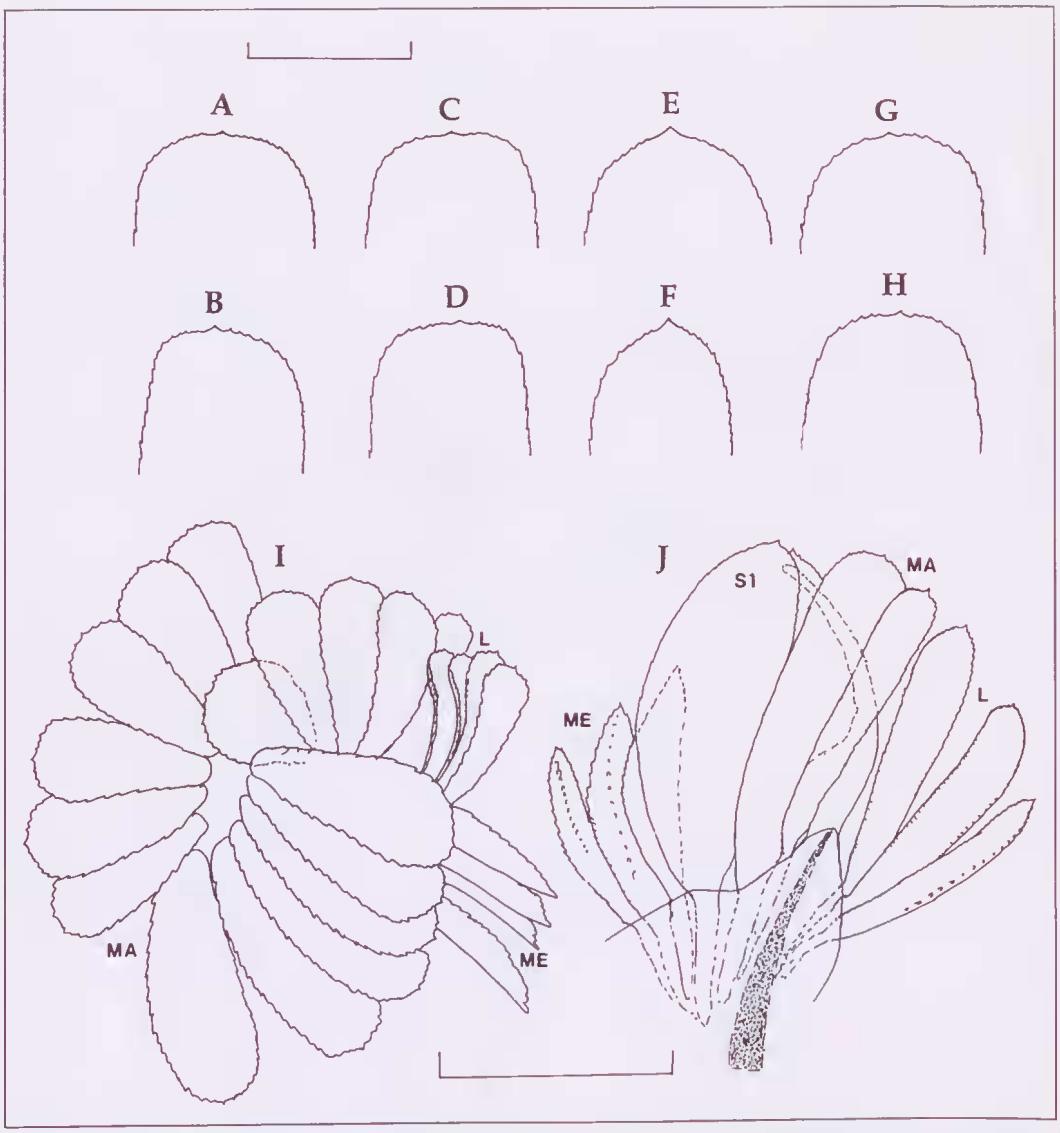

Fig. 6. Comparative paleae shapes. Eaeh pair represents a mid main palea (eg. A) and the medial-most tallest lateral palea (eg. B). Scale for a-h = 0.04 mm. **A, B**, *A. hanneloreae*, Townsville, Queensland, sediment, 2 m; **C, D**, *A. hanneloreae*, Cooks Passage, Great Barrier Reef, coral rubble, 10 m; **E, F**, *A. acropetalon*, north of Hinchinbrook Is., Queensland, 490 m; **G, H**, *A. reyssi*, Mar de Alboram, Spain, Mediterranean, coralline algae, 55 m; **I**, *A. hanneloreae*, NTM W21319, notopodium, segment 3; **J**, notopodium segment 51. Scale for I-J = 0.1 mm. Abbreviations as for Figure 1.

separates it from *A. hanneloreae* and *A. reyssi*. Mid-body segments have consistently higher numbers of paleae types and ribs in the lateral, main and median groups compared to *A. hanneloreae* (with a few exceptions, see Table 1). The subunit 1 palea is noticeably more slender than in *A. hanneloreae* and the subunit 2 palea is broader with 10-12 ribs rather than the customary seven to nine ribs (Fig. 5B). The ventral cirri are more slender than those seen in the other two species.

It also differs from *A. hanneloreae* and is similar to *A. reyssi* in possessing the lateral-most median palea as being the tallest palea in the fan in mid body segments (Fig. 5B).

Etymology. The species name *acropetalon* is from the Greek; *acro* meaning 'peak' and *petalon* 'leaf' and refers to the raised apices of the paleae. Gender neuter.

Arichlidon reyssi (Katzmann, Laubier and Ramos, 1974) new combination
(Figs 4C, 6G-I)

Bhawania reyssi Katzmann, Laubier and Ramos, 1974: 313-317, fig.1a-g. Type locality the Adriatic.

New genus new species 1 - Watson Russell 1986: 156; 1987: 660-670; 1991: 293.

Paleanotus heteroseta Rullier, 1964: 142-3.

Bhawania goodei Rosenfeldt, 1989: 219.

Chrysopetalum debile Cazaux, 1968: 536-541, figs 8, 9 (larvae).

Type material. HOLOTYPE - Adriatic Sea, 43° 41.3' N, 15° 44.2' E, 51 m, NMW 13222, coll. W. Katzmann; 35 segments, 3.8 mm length, 0.7 mm width, specimen in 2 halves. PARATYPES-locality as above, 24 segments, 2.2 mm length, 0.8 mm width; 31 segments, 2 mm length, 0.9 mm width, NMW 13222.

Additional material. MEDITERRANEAN, Spain, Mar de Alboran, from *Corallium rubrum* bottom, 40-55 m, coll. G. San Martin, 2, NTM W2590; eastern Mediterranean. 32° 54' N 31° 53.70' E - 32°55' N 31° 52.61' E, Stn. 25 Ku, sandy mud with shell debris, 196-199 m, coll. *Meteor*, 1 June 1993, 77, SMF 5002, (largest specimen 50 segments, 4.8 mm length, 1.4 mm width; smallest 13 segments, 1.3 mm length, 0.7 mm width); same locality and details, 5, NTM W13180; 34° 45.25', N 25°52.31' E - 34° 44.14' N, 25° 50.89' E, Stn. 18, soupy mud, 1386-1386 m, coll *Meteor*, 26 May 1993, 1, SMF 5004; 36°35.69' N 21° 31.95' E - 36° 37.68'N 21° 30.37' E, Stn. 16 Ku, soupy mud, 3832-3947 m, coll. *Meteor*, 22 May 1993, 1, SMF 5001; Egypt, Sinai, Katib el Galls, Stn. SLM 778-27V1-91, 121 m, 4 February 1968, 1 fragment, HUJ POLY220. EASTERN ATLANTIC, Cape Verde Islands, SW of Maio, 15° 06'N, 23° 13'W, 75 m, coll. H. Ten Hove, CANCAP expedition, 25 August 1986, 5, NTM W13190; west coast Brava Island, from red sponge, Stn. 52, rock, 20 m, coll. *Calypso*, 21 November 1959.1, MNHN A488; 15°26.5'N, 23°14' W, between Maio Is. and Boavista Is., Stn. 64, shelly bottom, 100 m, coll. *Calypso*, 24 November 1959, 2, MNHN A393. RED SEA.; Stn. SO-02/27TA, 757 m, MESEDA 1 Expedition, 16 October 1977, 1, SMF 3783; 13° 39.30' N, 42° 43' E, inside dead Atys shell, coll. John Murray Expedition 1933-4, 1 on slide, BMNH 1938.7.29.1; Egypt, Mission R. Pd. Dollfus, 15 December 1929, 1, MNHN A360.

Description. Holotype entire 35 segments. Anterior segments relaxed. Subulate median antenna visible on anterior edge of prostomium; two pairs of eyes visible above nuchal fold; two long cylindrical palps visible ventrally. Segment 2 with six short paleae with 12-14 ribs. Subsequent body segments with notosetae comprising four to six (seven) lateral paleae; outer group with 7-12 ribs, inner group with 12-16 (17) ribs. Main paleae number 10-14 with 14-19 ribs, four to seven raised ribs (three to four extending full length of palea). Most proximal main palea (subunit 1) slightly asymmetrical with 16-18 ribs and five raised ribs, present from 15th segment and continuing to posteriormost segment. Median paleae number three to five (two counts of six only on segment 3); medial group with 9-13 ribs, lateral group with 11-16 (18) ribs. Lateral-most median palea with 15-17 (18) ribs present about segment 5 to 6, continuing as tallest palea in entire paleae fan (Fig. 4C); within posterior 10 setigers becoming same height then shorter than paleae of main fan. Subunit 2, symmetrical, slim median palea with seven to nine ribs including two lightly raised ribs; present mid body, continuing to end of body (not always present on all posterior segments, often difficult to see). Main paleae broad with raised small apices, strong serrate margins, heavily ornamented raised ribs, dense to lighter granulation on superior palea surface (Fig 6G-J).

Neurosetae comprising superior group of one to two spinigers with long slim shafts and attenuated blades; one extra or replacement short spiniger present within

posterior setigers. Mid superior group comprising two (three to four on anterior setigers) long bladed falcigers in upper position and four to eight (10 anteriorly) medium length bladed falcigers below; both types with strong basally dentate blades. Mid inferior group of 6-10 falcigers with shorter broader blades. Inferior group of 6-10 falcigers with short broad blades.

Pygidium composed of slender ventral cone, one anal cirrus present (one broken) on dorsal pygidial structure.

Remarks. The distinguishing character of *Arichlidon reyssi*, the tall lateral-most median palea, is evident in mid-body segments in the majority of material examined, which separates it from the Australian species *A. hanneloreae*. In a mature dissected *A. reyssi* individual of 42 segments, this character is clearly present from setiger 5 to 35 and in the holotype from setiger 5 to 30 of 34 segments entire (Fig. 4C).

The MNHN Cape Verde specimens consisted of small fragments that recognisably belonged to *A. reyssi* as did the numerous specimens collected by the CANCAP Expedition, eg. forty two individuals from Stn. 7.047.

Abyssal depth material from the eastern Mediterranean did not differ markedly from those examined from the inter and sub-tidal depths of the Mediterranean and Adriatic. The tall lateral-most median palea, while present throughout the majority of segments within an individual, was at times absent. A juvenile specimen of 13 segments (SMF 5004) had a few tall median paleae present in the mid posterior body, although it came from the same collection as distinct *A. reyssi* adults.

Examination of *Arichlidon* material,

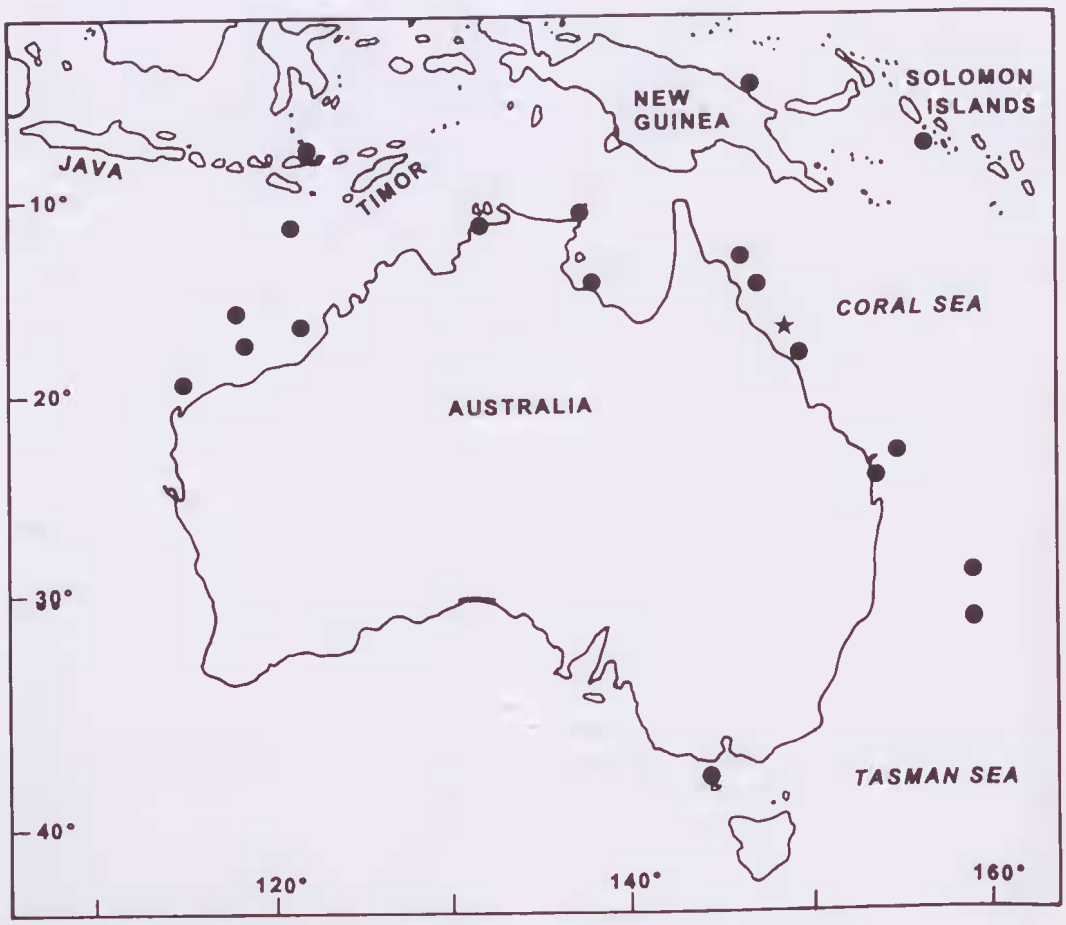

Fig. 7. Distribution map of *Arichlidon species*. Dot: *A. hanneloreae*. Star: *A. acropetalon*.

collected south of the Mediterranean from the Red Sea and Egypt, similarly contained specimens in which the tall lateral-most median palea of mid body segments were present or absent.

Distribution and habitat. The distribution of *A. reyssi* ranges from the Cape Verde Islands, NE Atlantic to the Mediterranean and Red Sea.

This species has been quite commonly collected from the Cape Verde Islands, from coarse sand, shell, rock and calcareous algae substrates in depths from 20 to 425 m. The marine fauna of the Cape Verde Islands represents West African species, American elements absent from the continental African plateau, small numbers of endemic species and the southern limit of east Atlantic and Mediterranean species (Rullier 1964); *A. reyssi* may belong to the last category.

Mediterranean material can be found from intertidal hard substrates to sandy muds with shell debris (199 m) and the beige brown soupy muds at 3947 m at sites in the eastern Mediterranean. These deep water stations have higher salinities than normal, ranging from 38.24‰ at Stn. 13Ku to 38.60‰ at Stn. 25Ku. Temperatures in the Levant Basin are also relatively warmer, ranging from 12.9° C at 862 m, 13.6° C at 3,947 m to 15.6° C at 199m. The Mediterranean is characterized by homothermy below ca. 200 m (Dieter Fiege pers. comm.).

Red Sea specimens range from intertidal to 757 m.

ACKNOWLEDGMENTS

I am grateful to the following people for the loan of material: Nechama Ben Eliahu (HUJ), Kristian Fauchald (USNM), Jeanne Renaud-Mornant (MNHN); Pat Hutchings (AM), E. Kritscher (NMW), Pat Mather (QM), Alex Muir (BMNH), Robin Wilson (NMV) and Susan Williams (LACM). Dieter Fiege (SMF) kindly lent material from the deep waters of the Eastern Mediterranean and Harry Ten Hove (ZMA) lent specimens from the Cape Verde Islands.

I would especially like to thank Guillermo San Martin for the gift of specimens from the Spanish Mediterranean coast and the Caribbean, and Thomas Perkins for his notes on material from Florida waters and the loan of planktonic adult specimens. I also would like to thank Sue Doyle at the SEM unit, Macquarie University, Sydney, for help with the SEM micrographs, anonymous reviewers for critically reading the manuscript and the Northern Territory Museum for funds to complete an earlier part of this study.

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Accepted 30 June 1998